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ABSTRACT

Educators must adapt the way they think about change if they and their students are to see the benefits of instructional technology. This new paradigm is called systemic change, and combines general systems theory and what has traditionally been called diffusion of innovations. This paper explores some of the lessons it holds for integration of technology into the Information Age classroom. The first thing to remember in planning education change is that education is a social enterprise. Success will depend on ability to maximize the satisfaction of the stakeholders or people that will affect and be affected by changes. A representative from each group of stakeholders should be involved. The second lesson is that to be effective and enduring, change must be implemented as a package. A core tenet of systemic change is that lasting reform comes not through any individual change but through a network of interrelated changes with effects throughout the system. Finally, educational institutions must be willing to change old assumptions about teaching and learning. Staff development, infrastructure improvements, changes in methodology, and stakeholder involvement are all necessary complements to installing the technology itself. (Contains 15 references.) (AEF)

Technology and Change for the Information Age

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Technology has infiltrated our lives during the last half-century. Initially, in education, it took the form of "audiovisual aids." Ever since, much has been said about its potential to "revolutionize" teaching and learning. Paradoxically, these same years have produced equally strident laments concerning the state to which American education has sunk. In 1983, as the microcomputer was being hailed as the latest panacea, the U.S. Department of Education released a report entitled A Nation at Risk, asserting that "the educational foundations of our society are presently being eroded by a rising tide of mediocrity that threatens our very future as a Nation and a people" (The National Commission on Excellence in Education, **1983**).

How do we reconcile these conflicting views? If we now know more about how people learn, if we have better tools for facilitating learning, why do so many studies of technology in education show no significant difference from traditional methods (Russell, **1995**)? Why are we producing graduates less able to cope with the issues facing them?

The reasons, like education itself, are complex. Instructional technology doesn't operate in isolation. It is used by faculty and students, its application governed by learning theory; it is affected by infrastructure issues like classroom design and network connectivity; it is bought by support staff at the direction of administrators with funding from trustees who represent constituents. Technology is part of an educational *system,* and is interdependent with all other parts.

As Rogers notes in *Diffusion of Innovations*, "a system is like a bowl of marbles: move any one of its elements and the positions of all the others are inevitably changed also" (Rogers, **1995**, p. 419). When technology is introduced "in isolation," it disturbs the rest of the system, reducing the system's effectiveness. In an effort to restore equilibrium, the system's other components exert pressure on the changed subsystem (technology) to conform to their requirements. Consequently, change is usually not implemented as its proponents envisioned. Often it is not implemented at all by many of its presumed (or even self-identified) users (Hall & Hord, **1987**, p. 101).

Making matters worse, the criteria for success have changed. Our institutions were designed for an industrial society, where learning was

subordinate to selection (Reigeluth, **1994**, p. 7). Now we've entered the Information Age. Increasingly, even blue-collar jobs require critical thinking, rather than rote task performance (**Ibid**.). To meet these demands, our graduates need different competencies than we typically provide. Intuitively, one would expect technology to be a powerful tool for meeting these new requirements, yet its use has often been hobbled by comfortable paradigms.

Such assumptions have combined to keep instructional technology from fulfilling those grandiose predictions. Gradually, we're learning that we must adapt the way we think about change if we, and our students, are to see those benefits. This new paradigm is called systemic change, and combines general systems theory and what has traditionally been called diffusion of innovations. This paper explores some of the lessons it holds for integration of technology into the Information Age classroom.

Involve Stakeholders Early

The first thing to remember in planning educational change is that ours is a social enterprise. It's easy to focus on implementation and forget the other *people* whose activities will affect and be affected by the changes we advocate. Consider just a few of these "stakeholders," identified by Minnesota's Information Infrastructure Working Group (**1996**) in the section titled, "Education and Lifelong Learning" and by Hutchins (**1994**, pp. 15-16). The Minnesota group identifies categories by function: curriculum developers, instructors, resident students, distance learners, parents and guardians, educational researchers, administrators, internal evaluators, and external evaluators. Hutchins, in contrast, emphasizes organizational categories: elected executives (e.g., mayors, governors, presidents), legislatures, courts, education agencies, health and human services agencies, service agencies or cooperatives, accreditation agencies, teacher- and administrator training institutions, professional associations and lobbying groups, and the public at large.

Their ostensibly shared goal of providing the best possible education does not prevent various stakeholders from viewing individual changes with vastly differing levels of enthusiasm. Your success will depend greatly on your ability to maximize their satisfaction. To do so, you must involve representatives from each category of stakeholders you identify (Hirumi, **1995**, in the section titled, "Create the Model"). Whether or not they have representatives present during planning or provide any input specifically to you at all, you should review any published guidelines or public statements dealing with their specific concerns and priorities. A little research now can go a long way toward avoiding problems later, when you might find your decisions put you out of synch with their requirements.

As an example of stakeholder involvement, suppose you want to use a

computer-based simulation in your teaching. You'll have to coordinate with academic computing (for technical support); they should be represented during all development activities. Other critical stakeholders will include your department chair, faculty colleagues, and students. Their involvement will be less, but is especially crucial. If the simulation has a distributed component (i.e., will be accessible from outside your institution), your public relations staff should also be involved at this level. Other stakeholders - who won't be represented, but whose requirements you'll want to consider - may include accreditation agencies, textbook suppliers, employers to which your graduates may apply, and instructional technology consultants.

Planning for this coordination helps you identify stakeholder concerns and maximize both efficiency and effectiveness. Furthermore, because your stakeholders have directly contributed to the project, they are more likely to feel some "ownership," and thus be committed to its success.

Plan for Systemic Effects

The second lesson is an extension of the first. Stakeholder groups interact with each other and with the system. That's what makes them stakeholders. It also means that they'll be affected by your changes. Bringing technology into the classroom creates pressure for change on fellow faculty, academic computing organizations, students, and on your teaching philosophy. The best teaching techniques in a technology-enhanced classroom differ greatly from those in traditional classrooms (Hinnant & Oliva, **1996**). Your assessment strategy may also change, because appropriate technology lets your students exhibit mastery in new ways. You may want to use strategies that were difficult in traditional classrooms. You might even have to address questions of values and priorities from parents, employers, or accrediting agencies.

To be effective and enduring, change must be implemented as a package. As stated before, learning environments are systems. When you change one part, you must adapt the whole to co-exist with this change. Otherwise, the system will reject the change like a patient rejects an incompatible organ. This is a core tenet of systemic change: lasting reform comes not through any individual change, but through a network of interrelated changes with effects throughout your system (Hirumi, **1995**, in the section titled, "How do you restructure education through systemic change?").

This is an important shift in perspective. The interconnectedness of systems is often seen as a constraint, but it can also be a benefit. For instance, your institution may have an established relationship with a nearby museum or corporation that can provide content for technology-enhanced lessons or a realistic structure for an interactive simulation, as Watts (**1996**) describes. This could garner the support of

organizations that see such interaction between students and the "wider world" as a desirable goal in itself. As another example, you may want to use the Internet to increase your students' exposure to foreign cultures or business practices, but you lack the time during class. Encouraging students to use technology to collaborate with peers at foreign institutions may create an opportunity for this exploration outside class as a byproduct. The ability to see the pitfalls of systemic interrelationships may help prevent implementation failure, but the ability to see their *opportunities* can engage curiosity, encourage commitment, and help secure *success*.

Challenge Old Assumptions

Finally, when change is being driven by changes in society, we must be willing to rethink everything about the way we teach and learn. Information technology removes many of the barriers within which our educational systems were designed, making systemic change an imperative. Educational institutions *can* choose for themselves not to change, but they cannot choose *for the competition*, and the same technologies that make change possible have also created new competitors. As Massy and Zemsky (**1995**) have noted, technology opens the continuous education market to entrepreneurs who feel they can meet learners' needs by adopting advances that colleges and universities have shunned. For the moment, colleges and universities have the clients, and are the recognized source for the "product." The challenge for our institutions is to maximize this advantage by using technology to reach out to these clients in new ways and, perhaps, even to reach out to *new* clients who were never before reachable.

Clearly, success in this involves identifying critical needs. Fortunately, systemic change research offers some insights as to what these might be. Reigeluth (**1994**, p. 8) lists these concepts and objectives as some of the assumptions to challenge, with their possible replacements:

- Class levels vs. continuous progress
- Covering the content vs. outcomes-based learning
- Norm-referenced vs. individualized testing
- Non-authentic vs. performance-based assessment
- Group-based content delivery vs. personal learning plans
- Adversarial vs. cooperative learning
- Classrooms vs. learning centers
- Faculty as dispensers of knowledge vs. coaches or facilitators of learning
- Rote memorization vs. creative thinking, problem-solving, and meaning-making
- Isolated reading, writing, and speaking skills vs. integrated communication skills
- Books vs. advanced information technologies as primary tools

Other insights are offered by business and industry, where survival *requires* agility. Because this environment is the major customer for our graduates, these discrepancies also affect higher education. In *Built to Last*, a survey of companies that appear to have adapted successfully, Collins and Porras (**1994**) stress that these "survivors" are not merely dominant in their technical fields, but also possess a carefully-developed "shared meaning." The authors define this as a consensus on core values like purpose and mission. Unfortunately, development of the skills to create such a consensus has not been a priority for today's educational systems.

An even more dramatic evolution is heralded by other authors, such as Kelly (**1994**) and Zachary (**1994**), who assert that a shift from centralized authority to empowered autonomy is critical to survival in the Information Age. They note that today's fast-paced world demands the ability to make decisions at the lowest level, as soon as the essential information is acquired. Organizations that do not allow this are outmaneuvered by more agile competitors. Education is ahead of the game here: faculty have more autonomy than industrial workers, but there may still be areas where bureaucracy can be reduced and the authority to act decentralized.

Your goal is to reengineer your institution to best serve your students, faculty and community. Don't be afraid of wishful thinking. Because you're thinking systemically, any constraints you place upon yourself when planning one subsystem will impose further constraints in all other systems with which they interact. Keep these concerns to a minimum until you have a "first draft" of your entire reengineered system; then get together with your stakeholders and identify practical limitations and their impacts (Jenks, **1994**, pp. 38-39). You may find that an "impossible" change in one subsystem was made feasible by a change you decided to make in another.

Go Forth and Be Systemic

Successful integration of educational technology involves more than buying computers and related equipment for your classrooms. Staff development, infrastructure improvements, changes in methodology, and stakeholder involvement are all necessary complements to installing the hardware. This list is by no means exhaustive; it merely forewarns you of the complexity you'll face, a complexity that has overwhelmed many previous innovations.

This doesn't mean you must discard or radically alter *all* your assumptions about education: they are, after all, based upon valuable experience. Systemic change merely asks that you *consider* those assumptions to see if you might achieve better results now without them. It does not require sweeping changes in *every* subsystem, nor

require that you satisfy *all* of your stakeholders all of the time. Systemic change merely recognizes the interconnectedness of these factors as education evolves to meet new demands.

Finally, a systemic approach does not guarantee success. However, by involving all stakeholders in an examination of how an innovation will affect your interconnected systems, it does help you consider those effects and reflect them in adjustments to your strategy. This, in turn, can dramatically improve your chances of success.

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Thanks again for your help...and *patience!*

--Jim

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